

## GEARED WHEELCHAIR

2.009 Team Yellow

Product Contract

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**Product Description:** A pair of replacement wheels that offers wheelchair users a mechanical advantage to traverse multiple terrains and surfaces more easily.

**Intended Customers:** Wheelchair users

**Market:** Retrofit wheelchair accessories

Customer Need	Product Attribute(s)	Engineering Specification(s)
Eases traversal of wide array of surfaces and slopes	Mechanical advantage	Reduce force input by 25% relative to the input required by a standard wheel to achieve the same force output
	Anti-rollback feature	Can counter a backward torque of at least 130N*m
Ability to shift between configurations at any time	Change shifter setting while in motion	Binary: yes
	Change shifter setting while stationary	Binary: yes
	Time required for user to change shifter setting	Less than 2 seconds
	Time required for user to engage/disengage uphill feature	Less than 2 seconds
	Time required for user to engage brake	Less than 1 second
	Location of shifter adaptable to user's dominant hand	Binary: yes
	Number of hands required to shift	1
Reduces sliding friction between user's hands and parts of moving wheels	Amount of sliding friction between user's hands and parts of moving wheels	No rotational sliding friction between user's hands and parts of moving wheels
Unobtrusive appearance	Appearance similar to standard manual wheelchair	80% of general public cannot tell the difference between our product and standard manual wheelchair from a distance of 15 feet

Easily transportable	Added weight	Less than 10 lbs of total additional weight
	Time for wheel release	Added time for wheel release is less than 5 seconds relative to standard wheels
	No impact on wheelchair ability to collapse	Added time to fold wheelchair is less than 5 seconds relative to standard wheels
Maintains ergonomics of standard manual wheelchair	Size of rim	Rim diameter is within 2 inches of standard wheelchair
	Rotational backlash in rim	Less than 10 degrees of rotational backlash in rim
	Location of brake	Brake interface is within 6 inches of hand rim
Maintains maneuverability of traditional wheelchair	Wheels can be driven forwards and backwards	Binary: yes
	Wheelchair width	Modified wheelchairs with widths that fall in the 25 <sup>th</sup> to 75 <sup>th</sup> percentile have a clearance of 4 inches through an ADA specified thruway
Lasts as long as standard manual wheelchair	Product lifetime	Lasts 1.5 million rotations of the wheel (~5 years) with a wheelchair occupant of 250lbs